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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/059,588	01/28/2002	Michael R. Krames	M-11547 US	5828

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EXAMINER

WILLE, DOUGLAS A

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 01/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

10/059,588

Applicant(s)

KRAMES ET AL.

Examin r

Douglas A Wille

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-- The MAILING DATE of this communication appears on th cover sheet with the correspondence address --

Period f r Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 January 2002 .
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-92 is/are pending in the application.
- 4a) Of the above claim(s) 47-92 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-46 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4 .
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 29 - 31 recite the limitation "said first electrode" in line 2. There is insufficient antecedent basis for this limitation in the claim since claim 25 does not show a first electrode.

Election/Restrictions

3. Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1 - 46, drawn to a device, classified in class 257, subclass 98.
- II. Claims 47 - 92, drawn to a method, classified in class 438, subclass 47.

The inventions are distinct, each from the other because of the following reasons:

4. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case instead of forming the holes in the semiconductor layers it would be possible to form a mask and then grow the layers through the mask.

5. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

6. During a telephone conversation with Gergely Zimanyi on 16 December 2002 a provisional election was made without traverse to prosecute the invention of I, claims 1 - 46.

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Affirmation of this election must be made by applicant in replying to this Office action. Claims 47 - 92 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

7. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1 - 3, 6, 7, 9 - 21, 25, 27, 28 and 31 - 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joannopoulos et al. in view of Imada et al.

10. With respect to claims 1 and 25, Joannopoulos et al. show a light emitting structure (see cover Figure and column 3, line 22 et seq.) where a periodic array of holes, which could be triangular (column 5, line 2), is provided and the material is GaAs (column 7, line 51) but do not show the spacing of the holes or an electrode structure. Imada et al. show a laser structure with a triangular lattice in InGaAsP and show a lattice constant of 0.462 microns with an active layer with a gap of 1.3 microns. It would have been obvious to use the lattice constant shown by Imada et al. in the Joannopoulos et al. device since it results in a working device. In the Imada et al.

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device the periodicity to wavelength ratio is in the range of 0.1 – 5 and both references show III-V materials. Note that Joannopoulos et al. show the holes as passing through the upper layer and the active layer and therefore the thickness of the second semiconductor layer is less than the wavelength of emitted light.

11. With respect to claims 2 and 28, Joannopoulos et al. show a p-n junction (column 7, line 47).
12. With respect to claim 3, the substrate is doped GaAs and it would therefore be obvious to use an electrode on the bottom of the device since the complexity of forming a mesa can be avoided.
13. With respect to claims 6 and 27, the surface recombination velocity is inherent in the structure.
14. With respect to claim 7, the elements of Joannopoulos et al. and Imada et al. are both III-V.
15. With respect to claims 9 and 32, the periodic structure is periodic in the plane of the structure.
16. With respect to claims 10 – 12, 33, 34, 35, the holes define the minima.
17. With respect to claims 13, 14, 36 and 37, Joannopoulos et al. show the array can be triangular, hexagonal, square or honeycomb (column 5, line 2).
18. With respect to claims 15 and 38, Joannopoulos et al. show that only the guided modes are polarized and the radiation modes show no polarization dependence.
19. With respect to claims 16 and 39, Joannopoulos et al. show the holes can be filled with a dielectric (column 8, line 13).

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20. With respect to claims 17 and 40, silicon oxide is a dielectric that has a low index and is commonly used with semiconductors and it would therefore be obvious to use it as a dielectric as a design alternative.

21. With respect to claims 18, 19, 41 and 42 emission at or near the band edge is inherent in the function of the device.

22. With respect to claims 20 and 43, Imada et al. show a fill factor of 0.2 (page 316, second column) and the dielectric constant runs between that for air and semiconductors.

23. With respect to claims 21 and 44, the extraction efficiency (column 4, line 5) is 70 % (column 5, line 59).

24. Claims 4, 5, 29, 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joannopoulos et al. in view of Imada et al. and Kurahashi.

25. Joannopoulos et al. and Imada et al. do not show the electrode structure and Kurahashi shows an electrode structure with a BDR on a substrate to provide surface emission where resistance increase is prevented. It would have been obvious to use such a structure for the advantages shown for those cases where substrate contacts are not possible such as with sapphire.

26. Claims 8, 22, 23, 26, 45 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joannopoulos et al. in view of Imada et al. and Vaudo et al.

27. With respect to claim 8, Vaudo et al. shows a GaN based Light emitting diode using (Ga, Al, In)N (see cover Figure and abstract). It would have been obvious to use the GaN material system instead of the GaAs shown by Joannopoulos et al. to provide a wider range of available wavelengths.

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28. With respect to claim 26, the material is III-V.

29. With respect to claims 22, 23, 45 and 46, Joannopoulos et al. show that the gaps in the emission occur for various values of c/a and it would have been obvious to design the device to meet specific requirements as a matter of design optimization.

30. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Joannopolous et al. in view of Imada et al. and further in view of Roberts et al.

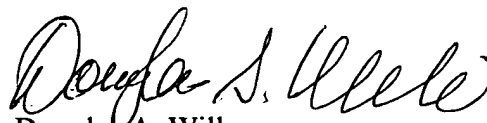
31. The basic device is an emitter structure without a housing, which would be necessary to make a finished device. Roberts et al. show a finished package that includes (see cover Figure and column 9, line 3 et seq.) a lead frame 205, heat sink 204 and transparent encapsulant 203.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas A Wille whose telephone number is (703) 308-4949. The examiner can normally be reached on M-F (6:15-3:45).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.


Douglas A. Wille
Patent Examiner

January 2, 2003